High Temperature Mechanical Properties

Capabilities/Facilities

Creep, Creep-Fatigue, Environmental Control, Tensile Testing and Fracture Behavior Testing Laboratories.

Materials

Oxide Dispersion Strengthened Alloys, Ferritic/Martensitic Alloys, Advanced Intermetallics, and High-temp Ni-based alloys (617, 230).

Scientific/Engineering Issues

Microstructure Stability and Embrittlement, Creep Mechanisms and Modeling, Effect of Environment of Creep and Fatigue Properties, and Engineering Properties Validation.

Staff

T. C. Totemeier, T. M. Lillo, and R. N. Wright.

Recent Projects

- Creep Characterization of ODS Fe3Al Alloys - DOE Fossil Energy $170K/year
- Creep and Embrittlement of Ferritic ODS Alloys - KNERI $100K/year
- Creep and Embrittlement of Ferritic ODS Alloys - KNERI $100K/year
- Solid Oxide Fuel Cell Stack Development - Bechtel National $300K/year
- Creep fatigue environment interactions in alloy 617 base metal and joints -DOE-NE $500K/year

Collaborations

- INEEL/ANL/ORNL/Ames Lab - BES Synthesis and Processing Center Project "Ultra-High Temperature Structural Intermetallics"
- INEEL/Auburn University - "Transient Liquid Phase Bonding of Oxide Dispersion Strengthened Alloys"
- Nexant Inc. "Solid Oxide Fuel Cell Stack Development"

Publications

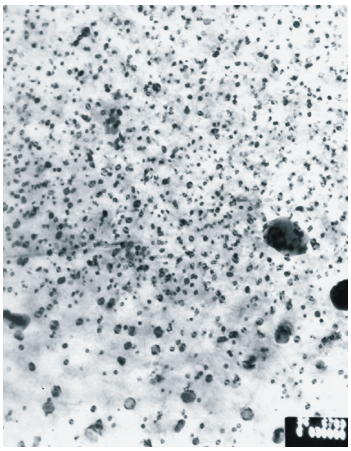
"Creep Behavior of an Oxide Dispersion Strengthened Iron Aluminide", R. N. Wright, M. T. Anderson and J. K. Wright, Materials Science and Engineering, Vol. A258, p. 285, 1998.

"Processing and Mechanical Properties of an Mo Silicide with the Composition Mo-12Si-8.5B", J. H. Schneible, M. J. Kramer, O. Unal and R. N. Wright, Intermetallics, Vol. 9, p. 25, 2001.

"Strength of Silicon Carbide Layers of Fuel Particles for High-Temperature Gas-Cooled Reactors", P.A. Lessing and R.J. Heaps, Nuclear Technology, 109[11], p. 207-234, 1994.

"Effect of Orientation on the Tensile and Creep Properties of Coarse-Grained INCONEL Alloy MA754", T. C. Totemeier and T. M. Lillo, Metullurgical and Materials Transactions A, Vol. 36A (2005), pp. 785-795

T. C. Totemeier and J. A. Simpson, "Effect of Off-Normal Austerization on Creep Strengths of Ferritic-Martensitic Steels", Procedures of the 4th International Conference on Advances in Materials Technology for Fossil Power Plants, Hilton Head, South Carolina, Oct. 25-28, 2004 (EPRI, 2004).



Transmission electron microscope image of oxide dispersion in an advanced intermetallic.

For more information

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Science

INL Idaho National Laboratory